

## A Low-Power Medical Oxygen Generator, Phase II

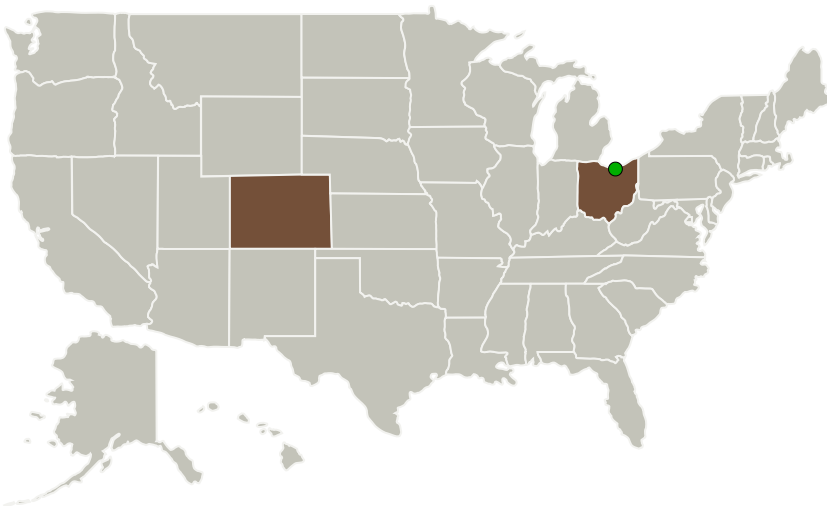
Completed Technology Project (2015 - 2017)



## Project Introduction

An on-board oxygen concentrator is required during long duration manned space missions to supply medical oxygen. The commercial medical oxygen generators based on pressure swing adsorption (PSA) are large and highly power intensive. TDA Research, Inc. (TDA) proposes to develop a small, lightweight, portable oxygen generator based on a vacuum swing adsorption (VSA) to produce concentrated medical oxygen. The unit uses ambient vehicle cabin air as the feed and delivers high purity oxygen while meeting NASA's requirements for high flow capacity, closed-loop tissue oxygen control and operation in microgravity/partial gravity. TDA's VSA system uses a modified version of the lithium exchanged low silica X zeolite (Li-LSX), a state-of-the-art air separation sorbent extensively used in commercial Portable Oxygen Concentrators (POCs) to enhance the N<sub>2</sub> adsorption capacity. In Phase I, we demonstrated the scientific, technical, and commercial feasibility of the oxygen concentrator module (OCM). In Phase II, we will develop a higher fidelity prototype with an adjustable pressure output to produce 2-15 lpm of O<sub>2</sub> at 50% to +90% purity from ambient cabin air. The OCM will be capable of self-regulating the oxygenation of the patient using a closed loop feedback system that senses tissue oxygenation level. We will evaluate the sorbent performance in a breadboard bench-scale prototype under simulated microgravity/partial gravity exploration atmospheres and carry out a 1,500 hr longevity test (at a minimum) to determine its mechanical durability. Based on the experimental results, we will design a prototype unit that will meet all of NASA's requirements (e.g., low power draw over the range of flows and oxygen levels, lightweight and volume), while delivering the desired oxygen flow and purity.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
TDA Research, Inc.	Lead Organization	Industry	Wheat Ridge, Colorado
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Colorado	Ohio

## Project Transitions

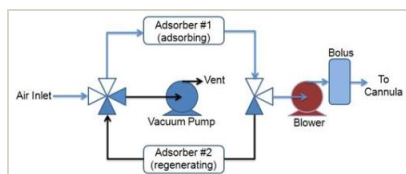
▶ **May 2015:** Project Start

✓ **November 2017:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137690>)

## Images



## Briefing Chart

A Low-Power Medical Oxygen

Generator Briefing Chart

(<https://techport.nasa.gov/image/129954>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

TDA Research, Inc.

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

Carlos Torrez

## Principal Investigator:

Gokhan Alptekin

## Co-Investigator:

Gokhan O Alptekin

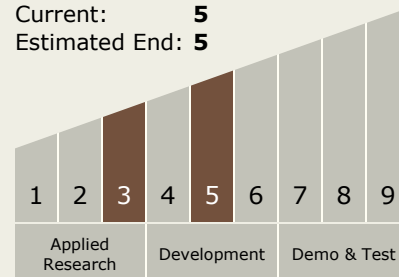
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### Technology Maturity (TRL)

Start: **3**  
Current: **5**  
Estimated End: **5**



### Technology Areas

#### Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - └ TX06.3 Human Health and Performance
    - └ TX06.3.6 Long Duration Health

### Target Destinations

Earth, The Moon, Others Inside the Solar System, Outside the Solar System, The Sun, Mars